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Bengaluru

Mid Term Examinations - October 2026

Date: 05/10/2026 **Time:** 11:45 AM - 01:15 PM

Course Code: EEE3015 **Course Name:** Industrial Automation with PLC and SCADA

Semester: Seventh Semester **Max. Marks:** 50 **Weightage:** 50%

CO - Levels	CO1	CO2
Marks	16	74

PART A: Answer Following Questions. 10 M

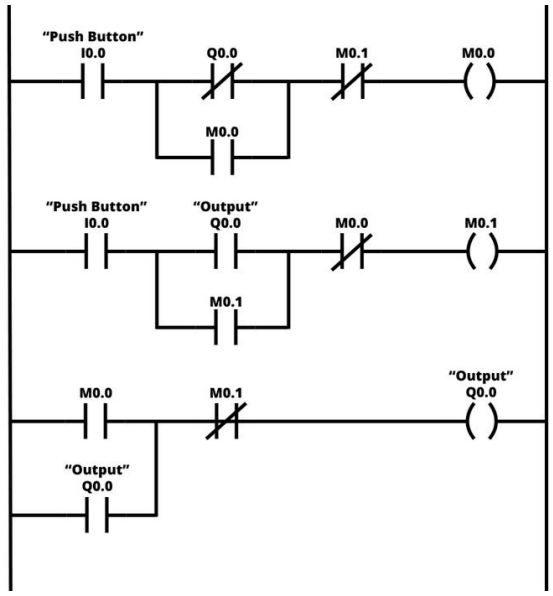
Q.N.	Questions	M	CO	BT
1	For an industrial automation application, state any two advantages and two disadvantages of using a PLC.	2	CO1	BT2
2	For a PLC input/output circuit, explain how sourcing and sinking configurations are used to connect field devices with the PLC.	2	CO1	BT2
3	For a PLC-based control system, formulate the Boolean equation. (A.B)+(C.D)= Q using a ladder logic diagram	2	CO1	BT3
4	For a PLC-controlled industrial process, explain how an On-Delay Timer (TON) instruction can be used to delay the activation of an output.	2	CO2	BT2
5	For a PLC-based counting application, identify the three common counter instructions and explain how each operates	2	CO2	BT2

PART B : Answer Any 1 Following Questions. 10 M

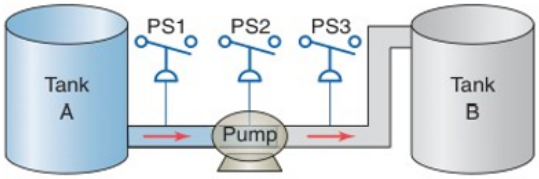
Q.N.	Questions	M	CO	BT
6	Apply PLC programming languages to design control solutions for KMF dairy industrial processes such as conveyor control, liquid level monitoring, and automated packaging systems.	10	CO2	BT3
7	Construct ladder diagrams to implement the following Boolean logic functions using PLC ladder logic: (a) AND, (b) OR, (c) NAND, and (d) NOR. Explain the operation of each ladder circuit and indicate the corresponding input and output conditions.	10	CO1	BT2

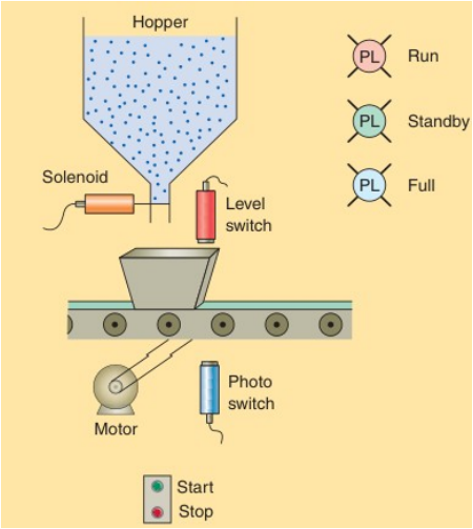
PART C: Answer Any 1 Following Questions. 10 M

Q.N.	Questions	M	CO	BT

8	Convert the given PLC ladder diagram into an equivalent logic gate diagram and derive the corresponding Boolean equation. Explain the relationship between the ladder logic and the logic-gate representation.  	10	CO2	BT3
9	A PLC-based motor control system is used to start a lube-oil pump motor, a main drive motor, and a feed motor in sequence. The lube-oil pump motor shall start when the START pushbutton is momentarily pressed and stop when the STOP pushbutton is pressed. When sufficient oil pressure is developed, a lube-oil pressure switch (PS1) shall close to start the main drive motor and initiate a 15 s time-delay period. After the preset time delay expires, the feed motor shall start automatically. Using appropriate sealing, timer, and control logic, construct a PLC ladder logic program and assign suitable PLC I/O addresses to implement the required sequence of operation.	10	CO2	BT3

PART D: Answer Any 1 Following Questions. 10 M				
Q.N.	**Questions**	**M**	**CO**	**BT**
10	Sketch the ladder diagram for a motorized overhead garage door is to be operated automatically to preset open and closed positions. The field devices include one of each of the following • Reversing motor contactor for up and down directions, • Normally closed down limit switch to sense when the door is fully closed • Normally Closed up limit switch to sense when the door is fully opened. • Normally open door up button for the up direction. • Normally open door down button for the down direction. • Normally closed door stop button for stopping the door. • Red door ajar light to signal when the door is partially open. • green door open light to signal when the door is fully open. yellow door closed light to signal when the door is fully closed.	10	CO2	BT3

11	A PLC-based liquid transfer system is designed to move fluid from Tank A to Tank B using a pump. The system includes a START pushbutton, STOP pushbutton, a pump motor, and three pressure switches (PS1, PS2, and PS3). The transfer process can begin only when PS1 is in the closed state. Upon pressing the START pushbutton, the pump should energize and remain running through a seal-in circuit even after the pushbutton is released. Pressing the STOP pushbutton must immediately stop the pump. Once the pump has been operating for 5 seconds, pressure switches PS2 and PS3 should be continuously monitored. If either of these switches opens after the 5-second period, the pump must stop instantly and enter a lockout condition. During this lockout period, the pump must not be allowed to restart for 14 seconds. Develop a PLC ladder logic program using suitable ON-delay (TON) and OFF-delay (TOF) timer instructions, and assign appropriate PLC input and output addresses to achieve the required control sequence. 	10	CO2	BT2

PART E: Answer Any 1 Following Questions. 10 M				
Q.N.	**Questions**	**M**	**CO**	**BT**
12	Construct the ladder logic program for the operation. Figure shows the sketch of the continuous filling operation. The process requires that boxes moving on a conveyer be automatically positioned and filled. 	10	CO2	BT2
13	A manufacturing system uses three motors that must remain operational for specific time intervals after a shutdown signal is received. Using off-delay timer (TOF) instructions, develop a PLC ladder logic program such that: Motor M1 turns OFF 5 seconds after the control switch is opened. Motor M2 turns OFF 10 seconds after the control switch is opened. Motor M3 turns OFF 15 seconds after the control switch is opened. The program should ensure that each motor continues running for its designated delay period following the shutdown command before being de-energized	10	CO2	BT2